Disease risk assessment for a potential release of Arabian Tahr (*Hemitragus jayakari*) in a protected area

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Threats to Tahr

- The Arabian tahr (*Hemitragus jayakari*) is a medium sized ungulate endemic to the mountains of the United Arab Emirates (UAE) and Oman.
- The Arabian tahr is endangered, with fewer than 2500 mature individuals in severely fragmented and declining populations.
- Tahr are threatened by (CBSG 2000-2001):
  - development (roads, dams)
  - overgrazing and competition by feral goats
  - hunting
  - habitat fragmentation
  - disease
  - inbreeding, resulting from small fragmented populations
- Tahr reintroduction was discussed as a possible conservation tool (EPAA 2002), especially in the UAE where only small isolated subpopulations are left.

- At this moment a reintroduction of Arabian tahr is not feasible due to insufficient captive numbers. A Population and Habitat Viability Assessment (PHVA) run at the CAMP workshop in 2000 using Vortex to estimate the minimum viable population, showed that a wild population in excess of 250-300 animals would need to be established.

Tahr Disease risk

- The impact of disease on wild populations is unknown as no epidemiological studies have been carried out, but tahr are most likely susceptible to the same diseases as goats.
- As with many other wild ungulate species (IUCN/SSC Caprinae 2008, Dubay 2003) contact with domestic or feral livestock poses serious risks, and the loss of genetic diversity in fragmented populations can increase the chances of disease outbreaks due to reduced immunity.

Table 1. Semi-quantitative Spotlight Hazard Analysis

Disease	Likelihood of susceptibility	Likelihood of exposure	Likelihood of becoming infected	Likelihood of transmitting to others	Severity to the individual if clinical	Severity for the population	Estimated significance to the programme	P of transmission from livestock to Tahr	P of transmission between livestock	P of transmission between Tahr	P of transmission from Tahr to livestock	Updated significance to the programme
CCPP	5	3	5	3	5	5	26	3	5	2	1	37
PPR	5	3	5	3	5	5	26	3	5	2	1	37
FMD	5	3	5	5	2	2	22	3	5	3	1	34
Pox	5	3	3	4	4	4	23	3	4	2	1	33
Johne's disease	3	3	3	3	5	5	22	3	4	2	1	32
Internal parasites	5	4	3	3	3	3	21	3	4	2	2	32
Brucella melitensis	5	3	3	2	3	5	21	2	4	3	1	31
Bovine Tuberculosis	5	3	2	2	5	5	22	2	3	2	1	30
Pasteurellosis	5	3	3	3	3	3	20	1	4	2	1	28
Leptospirosis	5	2	3	3	4	2	19	2	3	2	2	28
Ectyma	5	3	4	2	3	2	19	2	5	1	1	28
Chlamidophila	5	2	3	3	2	4	19	2	3	2	1	27
Contagious agalactia	5	2	3	3	3	3	19	2	3	2	1	27
Q fever	5	3	4	2	1	3	18	2	3	1	1	25
Campylobacter	3	3	2	3	2	2	15	3	3	2	2	25
Rift Valley Fever	5	2	3	2	2	5	19	1	1	1	1	23
Acariasis (mange)	5	3	2	2	2	2	16	1	4	1	1	23
Anthrax	5	1	3	1	5	2	17	1	2	1	1	22
Malignant catarral fever	3	2	3	3	5	2	18	1	1	1	1	22
Clostridiosis	5	4	3	1	3	2	18	1	1	1	1	22
Botulism	5	2	3	1	4	3	18	1	1	1	1	22
Bluetongue	5	3	2	1	5	3	19	1	3	1	1	21
Melioidosis	5	2	2	3	3	2	17	1	1	1	1	21
Listeriosis	5	1	3	1	5	1	16	1	1	1	1	20
Rinderpest	2	2	2	2	4	3	15	1	1	1	1	19
Rabies	5	1	1	1	5	2	15	1	1	1	1	19
Scrapie	2	1	2	2	5	2	14	1	1	1	1	18
CAE	5	1	2	2	2	2	14	1	1	1	1	18
Ticks	5	2	2	2	1	1	13	1	2	1	1	18
Warble fly	2	4	2	1	2	2	13	1	1	1	1	17
Dermatophytosis	5	2	2	2	1	1	13	1	1	1	1	17
Echinococcus	5	3	2	1	1	1	13	1	1	1	1	17
Myiasis	2	3	2	1	3	2	13	1	1	1	1	17
Footrot	2	2	1	1	3	2	11	1	3	1	1	17
Cryptosporidiosis	4	1	3	1	2	1	12	1	1	1	1	16
Maedi Visna	2	1	2	1	3	2	11	1	1	1	1	15
Salmonella abortusovis	2	2	1	2	2	2	11	1	1	1	1	15
Lumpy skin disease	1	1	1	1	2	2	8	1	1	1	1	12
Brucella ovis	1	1	1	1	2	2	8	1	1	1	1	12

Disease most likely to affect reintroduction. Every effort should be made to investigate these.
Disease could affect reintroduction. Investigate as much as possible.
Disease less likely to affect reintroduction. Investigate if possible.

- A disease risk assessment will be an integral part of reintroduction planning (Norton 1993). Many diseases are endemic in the area, and feral goats can be asymptomatic carriers of these infectious diseases. An assessment is necessary to avoid possible disastrous outbreaks in the tahr.
- A semi-quantitative Stoplight Hazard Analysis (Table 1) as outlined in the Disease Risk Handbook 5th edition (Armstrong *et. al.* 2003) was used to quantify and order particular diseases according to their importance for the reintroduction programme. The most important diseases are described further in more detail and suggestions for prevention and pre-release screening are given (Table 2).

Table 2. Example of a more detailed disease investigation

Disease
Peste des Petits Ruminants (PPR) is an acute contagious disease of small ruminants esp. goats, caused by a paramyxovirus of the genus Morbillivirus. Clinical signs include fever, nasal discharge, necrotic stomatitis, gastroenteritis and bronchopneumonia.

Likelihood of Susceptibility
Since it mainly affects goats and also sheep it can be assumed that the Tahr is highly susceptible although no cases have been described. Outbreaks have however been seen in other wild ungulates in the region such as captive gemsbok and gazelle.

Likelihood of exposure
PPR is endemic in this region and vaccination of domestic goats is advised but unvaccinated feral goats could spread the disease. Transmission of the disease requires close contact with ocular, nasal or oral secretions or with faeces. No carrier state exists but animals might already be infectious during the incubation period of 3-5 days. Good quarantine practice of incoming animals can avoid bringing in the disease into the captive population. Vaccinating domestic stock or creating a buffer zone would reduce the likelihood of exposure.

Likelihood of becoming infected
It is assumed that Tahr will become infected when in contact with the disease and can further pass on the infection.

Likelihood of transmitting to others
Morbidity in goats can reach 100% and in a group the chance that animals infect each other is very high. Tahr are however often kept individually in captivity and live in the wild solitary or in small units, behaviour that will reduce spread of the disease.

Severity for the individual
Since mortality in goats goes up to 100% it can be expected that mortality in Tahr will be as high.
Severity to the population
With a high mortality and high morbidity the disease could be potentially disastrous to the population. Because of the social structure in the wild the severity to the population might be limited.

Probability of transmission from livestock to wild ungulates
A high probability can be expected since feral goats are seen in larger groups where spread of the disease can be quick and they will roam around over large areas leaving fomites and faeces which can affect wild ungulates.
Samples required and tests.
When a case is suspected serum, swabs from discharge and organ samples should be collected for serology, PCR and isolation. Infected animals will be detected during the quarantine period when symptoms occur or when samples are collected.

Management
Vaccination against PPR is recommended in domestic goats. However feral goats will not be vaccinated and could potentially have and distribute the disease.
Tahr meant for reintroduction can be vaccinated with PPR vaccine, a measure that is already taken in most captive collections. There is however no research on how effective the vaccine is and on how often the vaccine needs to be repeated. It might be cautious though to vaccinate animals before release, since empirical evidence seems to indicate that in vaccinated collections no outbreaks have been seen. The vaccination needs however to be given annually so for released animals protection will probably only protect them for the first year.

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Often only scant data are available and hardly any data are available specifically for the Arabian tahr. The aim of this risk assessment is however not to create a perfect plan that needs to be carried out rigidly but to create a living document that needs to be updated continuously when new data on diseases, on susceptibility and on testing come available.

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